State of Illinois
Department of Registration and Education
STATE GEOLOGICAL SURVEY DIVISION
John C. Frye, Chief

GUIDE LEAFLET

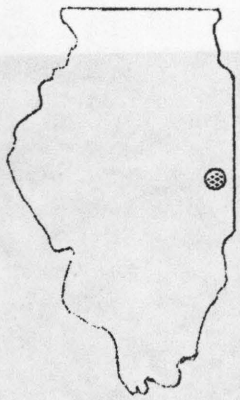
GEOLOGICAL SCIENCE FIELD TRIP

Sponsored by
ILLINOIS STATE GEOLOGICAL SURVEY

HOOPESTON AREA

Vermilion County

Hoopeston Quadrangle



Leaders
George M. Wilson, in charge
George E. Ekblaw

Urbana, Illinois
October 2, 1954

GUIDE LEAFLET 1954E

HOST: Greer High School

HOOPESTON GEOLOGICAL SCIENCE FIELD TRIP

Itinerary

0.0 0.0 Assemble on north side of Greer High School. Proceed west on Main Street.

0.4 0.4 STOP. Illinois Route 1. Turn right (north).

0.7 1.1 Stop 1. Back slope of Chatsworth Moraine. View northwest across glacial Lake Watseka.

The Hoopeston area offers an unusually good opportunity to study the effects of glacial drainage. The several moraines in the area are interrupted by numerous subglacial channels. Sand and gravel deposits occur in these channels and in the outwash plains and valley trains into which they merge. A glacial lake covered most of what is now Iroquois County. A review of the glacial history of Illinois will help you to understand the conditions under which these features were formed.

Many thousands of years ago most of Illinois, together with most of northern North America, was covered by huge ice-sheets or glaciers. These glaciers expanded from centers in what is now eastern Canada. They developed when for some reason, not yet determined, the mean annual temperatures in the region were somewhat lower than now, so that not all of the snow that fell during the winters was melted during the summers. The snow residues accumulated year after year until they became a sheet of ice so thick that, as a result of its weight, the ice began to flow outward, carrying with it the soil and rocks on which it rested and over which it moved. The process continued until the glacier extended into the Midwest as far south as the Missouri and Ohio Rivers.

Moderation of temperatures halted the glacier. For a while the melting of the ice balanced its accumulation and expansion, so that its margin remained stationary. Later the melting exceeded the accumulation and expansion, and the ice-front gradually melted back until the glacier disappeared entirely.

As the glacier melted, all of the soil and rocks which it had picked up as it advanced were released. Some of this material or drift was deposited in place as the ice melted. Such material consists of a thorough mixture of all kinds and sizes of rocks and is known as till. Some of the glacial drift was washed out with the melt-waters. The coarsest outwash material was deposited nearest the ice-front and gradually finer material farther away. Much of the finest clay was carried all the way to the ocean. Where the outwash material was spread widely in front of the glacier it forms an outwash-plain, and where it was restricted to the river valleys it forms what are called valley-trains.

At times, especially in the winters, the outwash-plains and valley-trains were exposed as the melt-waters subsided. The wind picked up silt and fine sand from their surfaces, blew these materials across the country, and dropped them to form deposits of what is known as loess. Glacial loess mantles most of Illinois. Near the large river valleys it may be as much as 60 to 80 feet thick. Far from the valleys it is measured only in inches, it if can be identified at all.

It is now commonly known that there were four major glaciations during the Pleistocene Epoch or "Great Ice Age" (see accompanying table), and that between each glaciation there were long interglacial intervals in which conditions were as they are today. It is also commonly known that during each major glaciation there were a number of retreats and readvances. This was particularly true during the last or Wisconsinan glaciation.

The glacial drift exposed in the Hoopeston area is all of Wisconsinan age, but drift belonging to the older Illinoian and Kansan Stages have been encountered in water wells. Probably the region was also invaded by the Nebraskan or oldest glacier, although no materials positively of Nebraskan age have been identified.

The position of the ice front during each advance of the glacier is usually marked by a ridge of till or an end moraine. The end moraine represents the accumulation of drift at the ice margin formed when the advance and melting of the glacier were essentially in balance. As more and more material was carried forward to the edge of the advancing ice, it piled up to form the end moraine. When melting exceeded the rate of advance, and the ice front retreated, the resulting drift deposits formed a drift-plain or till-plain, whose surface may be almost level or slightly rolling.

As shown on the accompanying map, there are several moraines of Wisconsinan age in Illinois. With the exception of the Shelbyville Moraine, which marks the maximum advance of the Wisconsinan glacier, each end moraine marks the position to which the ice front readvanced after a recession of some unknown distance from the position it had previously occupied.

The surface relief of end moraines is generally greater than that of the drift plains. It is generally referred to as swell-and-swale, but on some moraines it is termed knob-and-kettle topography. Generally the outer slope and edge of the moraines are interrupted by valleys and notches marking the courses of former glacial rivers. At some places there are gaps in the end moraines where subglacial streams presumably eroded away most of the drift. Subglacial valleys may be distinguished from valleys developed by erosion in postglacial time by the fact that morainic topography and glacial till occur all the way down the valley slopes.

This stop (Stop 1) is on the back slope of what may be the Chatsworth Moraine, the inner Cropsey Moraine, or the inner of two or three local crests of the Chatsworth Moraine. Later in the trip two other moraines south of Hoopeston will be observed. They are believed to be the Inner and Outer Cropsey Moraines, but again they may be either the Middle and Outer Cropsey, or an Outer Chatsworth and the Cropsey, or Middle and Outer Chatsworth Moraines. The uncertainty in identification of these moraines arises because in western Ford County the moraines that can be distinguished farther west merge eastward into what is apparently the junction of two lobes of the glacier, and the identities of the moraines east of the area as compared with those to the west is somewhat uncertain. The correlations given above as first alternatives are those which are currently considered correct.

As the glaciers receded, meltwater probably accumulated in local ponds or small lakes between the ice front and the last formed moraine, except where there were channels through the moraine through which the water could drain. Where such drainage channels are absent, it may be presumed that as the ice front continued to recede, the local ponds and lakes gradually merged into one large lake that persisted until the glaciers uncovered some outlet or until some river eroded a channel through which the lake could be drained.

Disregarding the early stages of local ponds and lakes, geological studies show that a large lake developed behind the Chatsworth Moraine in the Hoopeston area. In its earliest stages this lake, known as Lake Watseka, drained through four outlet channels, all essentially at an elevation of between 700 and 710 feet above mean sea-level in the vicinity of Hoopeston, and then down North Fork Wabash-Vermilion River. These channels are bordered by green on the field-conference map of the Hoopeston quadrangle. As the ice front receded, it uncovered near what is now Buckley a lower outlet for the lake to Illinois-Vermilion River to the west at an elevation about 670 feet above sea level, and the outlets near Hoopeston were consequently abandoned. Still later it exposed a still lower westward outlet at an elevation about 650 feet above sea-level near Onarga. Presumably the lake was completely drained when the glacier uncovered Kankakee River Valley. However, Lake Watseka must have been raised again to the 650 foot level when the Marseilles glacier readvanced and again blocked Kankakee Valley. It was again raised when the Kankakee Torrent, formed by melting of the Valparaiso glacier, flooded Kankakee and Illinois Valleys (see accompanying map).

The topography of the area that was submerged by Lake Watseka at its lowest level is quite flat. The lake deposits consist of laminated clay, laminated silt, and marl. The additional area occupied at the intermediate level is similar but not quite as flat, and the lake deposits are not so well developed. The area occupied only at the highest level is relatively flat, but in it the higher elevations of the drift plain still stand as low rounded hills. Near the margin of the lake these elevations were islands. The elevations were partly eroded by the lake waters, and the depressions between were partly filled with silt, so that these areas are flatter and more extensive than a normal drift plain.

0.8 1.9 Turn left (west) on gravel road.

1.1 3.0 Turn left (south).

0.6 3.6 Stop 2. An outlet channel of Lake Watseka. The channel trends from northwest to southeast.

0.9 4.5 CAUTION. Railroad Crossing.

0.3 4.8 Another Lake Watseka outlet channel, trending from west to east.

0.2 5.0 Stop 3. Exposure of weathering profile developed on Chatsworth till.

Like many other materials, rocks and minerals undergo changes when they are exposed to the weather. Although these changes occur relatively slowly, they become evident in earth deposits that are not disturbed over long periods of time, and a weathering or soil profile develops in the surficial part of such deposits.

Following the practice established about 30 years ago by the Russian, Glinka, soil scientists usually consider that the soil or weathering profile consists of 3 zones, designated A, B, and C from top down. The A zone is the "soil" zone, which is normally black or gray in color. The B zone is the "subsoil" zone, and the C zone is the unaltered parent material.

The zonal effect is due to four principal processes which effect soil weathering, all progressing downward with the movement of groundwater but at different rates. These processes, listed in order according to their rates of progress, beginning with the most rapid, are (1) oxidation, (2) leaching of carbonates, (3) decomposition of more resistant minerals, and (4) accumulation of humus.

Consequently, in the A zone, in which the humus material derived from decaying plants has accumulated, the rock minerals are oxidized, leached, and decomposed. In the upper part of the B zone they are oxidized and leached, and in the lower part of the B zone they are only oxidized. The oxidation zone is shown by the reddish or yellowish color resulting from the oxidation of iron minerals. The leached zone is determined by the absence of carbonates, as revealed by tests with a solution of hydrochloric acid.

0.1 5.1 STOP. Illinois Route 9. Turn left (east).

0.5 5.6 Stop 4. View of outlet channels of Lake Watseka.

0.3 5.9 Outlet channel of Lake Watseka. Formerly there were large gravel pits on both sides of the highway, showing the existence of valley train outwash along the channel.

0.4 6.3 STOP. Illinois Route 1. Continue straight ahead.

0.3 6.6 Crossing east outlet channel of Lake Watseka.

0.6 7.2 CAUTION. Railroad crossing.

0.6 7.8 Good view of Inner Cropsey Moraine to south.

0.8 8.6 West side of glacial drainage valley.

0.8 9.4 Turn left (north) on gravel road.

0.4 9.8 Stop 5. Gravel pit in valley train along North Fork Vermilion River.

While the Chatsworth glacier stood at its most advanced position and was forming the Chatsworth Moraine, the meltwater from the portion of the glacier east of what is now Hoopeston flowed westward on the drift plain behind the Cropsey Moraine and then escaped southward through a subglacial channel across the Chatsworth Moraine. The meltwater then flowed through what is now the valley of North Fork Vermilion River. This meltwater carried considerable outwash which was deposited, not only as a valley train along the principal valley, but also in the numerous tributary streams leading from the glacier. The courses of these tributaries now appear as subglacial channels along the front or across the moraine.

The texture, variation of size, degree of sorting, horizontal bedding, etc., of the deposits exposed in the pit at this stop are characteristic of valley train outwash. The thickness of the deposits is variable. The gravel is underlain by till, pieces of which are sometimes dragged up from the pit bottom by the drag scrapers. This till is presumably Cropsey in age. More gravel is reported to underlie the till, and if so it is either intra-Cropsey, pro-Cropsey, or pre-Cropsey in age.

0.1	9.9	Return to road and head south.
0.4	10.3	STOP. Illinois Route 9. Turn right (west).
2.6	12.9	Turn right (north) on South 6th Avenue.
0.4	13.3	Turn left (west) on West Washington Street.
0.2	13.5	Stop 6. Lunch. Enter McFerren Park.
0.1	13.6	Leave McFerren Park. Turn left (west) on West Penn Street.
0.1	13.7	STOP. Illinois Route 1. Turn left (south).
0.7	14.4	Abandoned gravel pit on left in valley train outwash.
2.1	16.5	South outlet channel of Lake Watseka.
0.9	17.4	Turn left (east) on gravel road. Note gravel pit on north side of road east of corner.
0.2	17.6	Stop 7. Valley train terraces and outlet channel of Lake Watseka in valley of North Fork Vermilion River.
0.5	18.1	CAUTION. Railroad crossing. Cropsey till exposed on both sides of road on west side of tracks.
0.3	18.4	Crest of Inner Cropsey Moraine.
0.5	18.9	Stop 8. Poorly drained drift plain between Inner and Outer Cropsey Moraines.

The soil is very sandy and silty. The light-colored soil is silt brought up by extra-deep plowing. The mound to the north may be a low sand dune. A considerable amount of sand is associated with both the Inner and Outer Cropsey Moraines, and locally it has been blown into dunes. There was probably an appreciable amount of sandy outwash carried into this intra-morainic area by the meltwater from the Inner Cropsey glacier. West of North Fork Vermilion River the Inner and Outer Cropsey Moraines merge, so that only one moraine is evident, but locally the moraine displays two crests.

1.0	19.9	T-road. Turn right (south).
0.5	20.4	Jog right and left.

0.2 20.6 Entering subglacial channel through Outer Cropsey Moraine.

0.3 20.9 Jog right and left.

0.3 21.2 Axis of outer Cropsey Moraine.

0.2 21.4 Jog left and right.

1.1 22.5 STOP. Single-lane paved road. Turn left (east). Beginning of dune area.

0.7 23.2 Stop 9. Sand Dunes

In a limited area here the sand in the outwash plain in front of the Outer Cropsey Moraine has been reworked by the wind and some of it has been blown into dunes. One of these dunes bounds the south side of the highway, and others are visible to the north and northwest.

The small valley here shows two cycles of erosion. The first resulted in the broad flat bottom, in which the present channel has been incised. The broad valley bottom was created when for some reason the stream was at a temporary base level, so that it could no longer deepen the valley, and therefore its erosive energy was used in widening the valley. The temporary base level that determined this action was either (1) a level caused by the filling of the valley of North Fork Vermilion River with outwash from the Chatsworth glacier or (2) a level down to which the outlet waters of Lake Watseka had eroded the valley.

1.1 24.3 East margin of dune area; another graded valley.

0.5 24.8 Stop 10. Sandy outwash plain.

Topographically this area appears much like the dune area to the west. The mound on which we stand appears much like a dune, but a casual examination of the soil reveals that it includes an abundance of pebbles, some of them up to 2 inches in size, which could not be wind-borne. Consequently we know it is the sandy outwash plain in front of the Outer Cropsey Moraine.

Careful observation of this outwash plain reveals that here it consists of a number of alternating low ridges and shallow swales running northeast and southwest. The ridges were probably bars and the swales were channels on the outwash plain, tranding southwesterly from the ice-front.

0.5 25.3 Turn left (north) on single-lane pavement.

Good view of outwash-plain to west. One of the channel swales in the plain traverses this field from the northeast to the southwest corners.

1.0 26.3 Elongate bar ridge to west.

0.2 26.5 Swale on west side of bar.

0.7 27.2 On outwash apron at base of Outer Cropsey Moraine.

0.2 27.4 Outer margin of Outer Cropsey Moraine.

0.1 27.5 Exposure of Cropsey till along east side of road.

0.8 28.3 Descending into subglacial channel through Outer Cropsey Moraine.

0.2 28.5 Stop 11. Exposure of silt, sand, and gravel outwash in subglacial channel on and against Cropsey till.

End of Field Trip

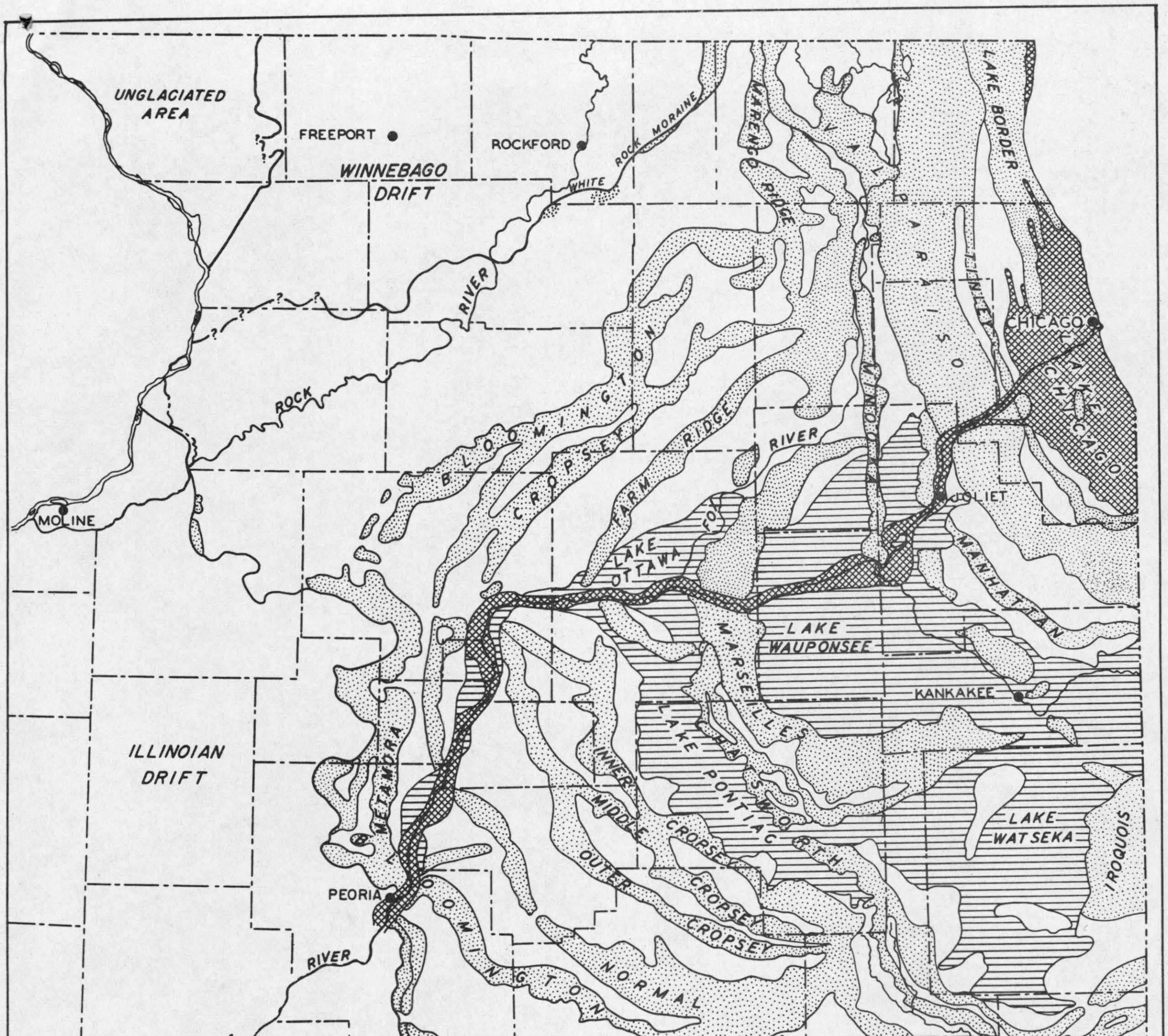
DRIVE CAREFULLY ON YOUR WAY HOME

Continue north 3 miles to Route 9, or turn around and return 3 miles to east-west single lane paved road and follow it west 4 miles to Rossville and Route 1.

Revised and reprinted July 1966

TIME TABLE OF PLEISTOCENE GLACIATION
(Illinois State Geological Survey, 1969)

STAGE	SUBSTAGE	NATURE OF DEPOSITS	SPECIAL FEATURES
RECENT	Years Before Present	Soil, youthful profile of weathering, lake and river deposits, dunes, peat	
	5,000		
	Valderan	Outwash	Outwash along Mississippi Valley
	11,000		
	Twocreekan	Peat and alluvium	Ice withdrawal, erosion
	12,500		
WISCONSINAN (4th glacial)	Woodfordian	Drift, loess, dunes, lake deposits	Glaciation, building of many moraines as far south as Shelbyville, extensive valley trains, outwash plains, and lakes
	22,000		
	Farmdalian	Soil, silt, and peat	Ice withdrawal, weathering, and erosion
	28,000		
	Altonian	Drift, loess	Glaciation in northern Illinois, valley trains along major rivers, Winnebago drift
	50,000 to 70,000		
SANGAMONIAN (3rd interglacial)		Soil, mature profile of weathering	
ILLINOIAN (3rd glacial)	Buffalo Hart	Drift	Glaciers from northeast at maximum reached Mississippi River and nearly to southern tip of Illinois
	Jacksonville	Drift	
	Liman	Drift, loess	
YARMOUTHIAN (2nd interglacial)		Soil, mature profile of weathering	
KANSAN (2nd glacial)		Drift Loess	Glaciers from northeast and northwest covered much of state
AFTONIAN (1st interglacial)		Soil, mature profile of weathering	
NEBRASKAN (1st glacial)		Drift	Glaciers from northwest invaded western Illinois



GLACIAL MAP OF NORTHEASTERN ILLINOIS

George Ekblaw

Revised 1960